Tebuthiuron

HERBICIDE FACT SHEET

U.S. DEPARTMENT OF ENERGY
BONNEVILLE POWER ADMINISTRATION

This fact sheet is one of a series issued by the Bonneville Power Administration for their workers and the general public. It provides information on forest and land management uses, environmental and human health effects, and safety precautions. A list of definitions is included in Section VIII of this fact sheet.

I. BASIC INFORMATION

COMMON NAME: tebuthiuron

CHEMICAL NAME: N-[5-(1,1-dimethylethyl)-1,3,4-thiadiazol-2-yl]-N,N'-dimethylurea

Cas No. 34014-18-1

CHEMICAL TYPE: substituted urea

PESTICIDE CLASSIFICATION: herbicide

REGISTERED USE STATUS: General Use Pesticide. Restricted Use Pesticide in Washington.

FORMULATIONS: Commercial herbicide products generally contain one or more ingredients. An inert ingredient is anything added to the product other than an active ingredient. Because of concern for human health and the environment, EPA announced its policy on toxic inert ingredients in the Federal Register on April 22, 1987 (52FR13305). This policy focuses on the regulation of inert ingredients. EPA's strategy for implementing this policy included the development of four lists of inerts, based on toxicological concerns. Inerts of toxicological concern were placed on List 1. Potentially toxic inerts/high priority for testing were placed on List 2. Inerts of unknown toxicity were placed on List 3, and inerts of minimal concern were placed on List 4.

The inert ingredients of the tebuthiuron formulations are not classified by the USEPA as inert ingredients of toxicological concerns to humans or the environment.

The contents of the tebuthiuron formulations are listed below:

Spike® 20 P Herbicide		Spike® 80 DF Herbicide		Spike® 80 W Herbicide	
Tebuthiuron	20 %	Tebuthiuron	80 %	Tebuthiuron	80 %
Inert	80 %	Inert	20 %	Inert	20 %

RESIDUE ANALYTICAL METHODS: EPA Method 632.

II. HERBICIDE USES

REGISTERED FORESTRY, RANGELAND AND RIGHT-OF-WAY USES: Tebuthiuron is registered for use in non-crop sites for selective and total plant control. For terrestrial use only.

OPERATIONAL DETAILS:

TARGET PLANTS: Tebuthiuron is a pre- and post-emergent total herbicidal control for weeds and brush.

MODE OF ACTION: Tebuthiuron is absorbed by the roots inhibiting photosynthesis.

METHOD OF APPLICATION AND RATES: Aerial and ground broadcast, spot and localized applications at 0.2 to 2.5 lbs./acre.

SPECIAL PRECAUTIONS:

TIMING OF APPLICATION: Just before or during active plant growth.

DRIFT CONTROL: Care should be exercised not to overspray or apply the herbicide to adjacent non-target areas. Drift control is achieved by observing weather conditions and following label and sprayer instructions. Spray droplet size should be 150 microns or larger.

RESTRICTIONS/WARNINGS/LIMITATIONS: Do not apply more than 1.25 lb./acre of any Spike formulation in areas with less than 20 inches of annual rainfall. Don not apply more than 2.5 lb./acre of any Spike formulation in areas with more than 20 inches of annual rainfall. Do not enter the treated area until the spray has dried. Do not apply through any type of irrigation system. Do not graze or feed forage from treated areas for 2 weeks after treatment. Groundwater advisory. Do not apply within areas identified as groundwater protection zones. Surface water and drift advisory. Non-target plant advisory.

III. ENVIRONMENTAL EFFECTS/FATE

SOIL:

RESIDUAL SOIL ACTIVITY: The half-life of tebuthiuron is 360 days.

ADSORPTION: The K(oc) of tebuthiuron is 80.

PERSISTENCE AND AGENTS OF DEGRADATION: Tebuthiuron is highly persistent in the plant and soils. The primary route of degradation is microbial activity.

METABOLITES/DEGRADATION PRODUCTS AND POTENTIAL ENVIRONMENTAL EFFECTS: Breakdown products are found in very low concentrations and should be relatively non-toxic.

WATER:

SOLUBILITY: 2500 mg/l in water (pH 7 at 25° C).

POTENTIAL FOR LEACHING INTO SURFACE AND GROUND WATER: Tebuthiuron is moderately persistent with a moderate soil adsorption coefficient. There is a very high potential for tebuthiuron to leach into groundwater and a high potential for surface water runoff.

AIR:

VOLATILIZATION: 0.27 mPa at 25° C.

POTENTIAL FOR BYPRODUCTS FROM BURNING OF TREATED VEGETATION: Not known.

IV. ECOLOGICAL TOXICITY EFFECTS ON NON-TARGET SPECIES

MICROORGANISMS:

ACUTE CONTACT TOXICITY: LD_{50} (honey bee contact) 30 ug/bee

OVERALL TOXICITY: Slightly Toxic

PLANTS: Contact will injure or kill target and non-target plants.

AQUATIC VERTEBRATES:

ACUTE TOXICITY: LC_{50} (rainbow trout 96-hour) 87 mg/l

ACUTE TOXICITY: LC_{50} (bluegill sunfish 96-hour) 87 mg/l

OVERALL TOXICITY: Slightly Toxic

AQUATIC FRESHWATER INVERTEBRATES:

ACUTE TOXICITY: LC_{50} (*Daphnia magna* 48-hour) 225 mg/l

OVERALL TOXICITY: Practically Non-Toxic

AQUATIC ESTUARINE/MARINE INVERTEBRATES:

ACUTE TOXICITY: EC_{50} (pink shrimp 96-hour) 48 mg/l

ACUTE TOXICITY: EC_{50} (fiddler crab 96-hour) 320 mg/l

OVERALL TOXICITY: Slightly Toxic

TERRESTRIAL ANIMALS:

AVIAN ACUTE ORAL TOXICITY: LD_{50} (mallard duck) >2500 mg/kg

AVIAN ACUTE ORAL TOXICITY: LD_{50} (bobwhite quail) >2500 mg/kg

AVIAN SUBACUTE DIETARY TOXICITY: LC_{50} (bobwhite quail) >5000 mg/kg

AVIAN SUBACUTE DIETARY TOXICITY: LC_{50} (mallard duck) >5000 mg/kg

MAMMAL ACUTE ORAL TOXICITY: LD_{50} (rat) 644 mg/kg

OVERALL TOXICITY: Slightly Toxic

BIOACCUMULATION POTENTIAL: Little Potential

THREATENED AND ENDANGERED SPECIES: Federally listed terrestrial and aquatic plants may be adversely affected if the product is applied directly to the plants, or indirectly as the result of drift or leaching.

V. TOXICOLOGICAL DATA

ACUTE TOXICITY:

ACUTE ORAL TOXICITY: LD_{50} (rat) 644 mg/kg

ACUTE DERMAL TOXICITY: LD_{50} (rabbit) >200 mg/kg

PRIMARY SKIN IRRITATION: Rabbit - Slight Irritant

PRIMARY EYE IRRITATION: Rabbit – Slight Irritant

ACUTE INHALATION: LC_{50} (rat) 3.7 mg/l

OVERALL TOXICITY: Category III – Slightly Toxic

CHRONIC TOXICITY:

CARCINOGENICITY: EPA Group E - Not classifiable as a human carcinogen.

DEVELOPMENTAL/REPRODUCTIVE: No adverse effects.

MUTAGENICITY: No adverse effects.

HAZARD: The end-use product labels for the tebuthiuron formulations carry the *Caution* signal word due to potential eye skin and inhalation hazards.

VI. HUMAN HEALTH EFFECTS

ACUTE TOXICITY (POISONING):

REPORTED EFFECTS: Eye irritation, skin irritation, nausea, vomiting, dizziness, sweating, headache and sore throat have been reported.

CHRONIC TOXICITY:

REPORTED EFFECTS: None reported.

POTENTIAL FOR ADVERSE HEALTH EFFECTS FROM CONTACTING OR CONSUMING TREATED VEGETATION, WATER OR ANIMALS: See effects reported under acute toxicity.

POTENTIAL FOR ADVERSE HEALTH EFFECTS FROM INERT INGREDIENTS CONTAINED IN THE FORMULATED PRODUCTS: None.

HEALTH EFFECTS OF EXPOSURE TO FORMULATED PRODUCTS: Both Spike 20P and 80W contain kaolin. Kaolin, or crystalline silica, is listed as a carcinogen.

HEALTH EFFECTS ASSOCIATED WITH CONTAMINANTS: None reported.

HEALTH EFFECTS ASSOCIATED WITH OTHER FORMULATIONS: None reported.

VII. SAFETY PRECAUTIONS

SIGNAL WORD AND DEFINITION:

TEBUTHIURON - **CAUTION** – CAUSES EYE IRRITATION. HARMFUL IF SWALLOWED, INHALED, OR ABSORBED THROUGH THE SKIN.

PROTECTIVE PRECAUTIONS FOR WORKERS: Applicators and other handlers must wear long-sleeved shirt and long pants, shoes plus socks.

MEDICAL TREATMENT PROCEDURES (ANTIDOTES):

EYES: Flush eyes with water for 15 minutes. Call physician.

SKIN: Wash all exposed areas with soap and water, call physician if irritation persists.

INGESTION: Call physician. Do not induce vomiting.

INHALATION: Remove to fresh air. Call a physician if breathing difficulty persists.

HANDLING, STORAGE AND DISPOSAL: Store at room temperature or cooler. Do not reuse container. Rinse container and dispose accordingly.

EMERGENCY SPILL PROCEDURES AND HAZARDS: Contain and sweep up material of small spills and dispose as waste. Do not contaminate water, food, or feed by storage or disposal.

VIII. DEFINITIONS

adsorption – the process of attaching to a surface

avian – of, or related to, birds

CAEPA – California Environmental Protection Agency

carcinogenicity – ability to cause cancer

CHEMTREC – Chemical Transportation Emergency Center

dermal – of, or related to, the skin

EC_{50} - median effective concentration during a bioassay

ecotoxicological – related to the effects of environmental toxicants on populations of organisms originating, being produced, growing or living naturally in a particular region or environment

FIFRA – Federal Insecticide, Fungicide and Rodenticide Act

formulation – the form in which the pesticide is supplied by the manufacturer for use

half-life – the time required for half the amount of a substance to be reduced by natural processes

herbicide – a substance used to destroy plants or to slow down their growth

Hg – chemical symbol for mercury

IARC – International Agency for Research on Cancer

K(oc) – the tendency of a chemical to be adsorbed by soil, expressed as: K(oc) = conc. adsorbed/conc. dissolved/% organic carbon in soil

LC_{50} – the concentration in air, water, or food that will kill approximately 50% of the subjects

LD_{50} – the dose that will kill approximately 50% of the subjects

leach – to dissolve out by the action of water

mg/kg – weight ratio expressed as milligrams per kilogram

mg/l – weight-to-liquid ratio expressed as milligrams per liter

microorganisms – living things too small to be seen without a microscope

mPa – milli-Pascal (unit of pressure)

mutagenicity – ability to cause genetic changes

NFPA – National Fire Protection Association

NIOSH - National Institute for Occupational Safety and Health

NOEL - no observable effect level

non-target – animals or plants other than the ones that the pesticide is intended to kill or control

OSHA - Occupational Safety and Health Administration

Pa – Pascal (unit of pressure)

persistence – tendency of a pesticide to remain to remain in the environment after it is applied

pesticides – substances including herbicides, insecticides, rodenticides, fumigants, repellents, growth regulators, etc., regulated under FIFRA

PPE – personal protective equipment

ppm – weight ratio expressed as parts per million

residual activity – the remaining amount of activity as a pesticide

T&E – Threatened and Endangered Species (from the Endangered Species Act)

µg – micrograms

volatility – the tendency to become a vapor at standard temperatures and pressures

IX. INFORMATION SOURCES

Dow AgroSciences, Tordon® 22K Specialty Herbicide, Specimen Product Label, Label Code: D02-111-008, February 22, 1999

Dow AgroSciences, Tordon® 22K Specialty Herbicide, Material Safety Data Sheet, MSDS: 000380, October 6, 1998

EPRI, Determination of the Effectiveness of Herbicide Buffer Zones in Protecting Water Quality, EPRI Final Report TR-113160, 1999

Extension Toxicology Network, Pesticide Information Profile, Tebuthiuron, June 1996 http://ace.orst.edu/info/extoxnet/pips/ghindex.html

Extension Toxicology Network, Toxicology Information Briefs: Bioaccumulation, Revised 1993, http://ace.orst.edu/info/extoxnet/tibs/bioaccum.htm

Spray Drift Task Force, A Summary of Ground Application Studies, 1997 http://www.agdrift.com/publications/Body.htm

USDA Forest Service, Pesticide Fact Sheet, Tebuthiuron, November 1995 http://www.fs.fed.us/foresthealth/pesticide/index.html

USEPA, Office of Pesticide Programs, Reregistration Eligibility Decision, Tebuthiuron, EPA-738-R-95-019, August 1995 http://www.epa.gov/oppsrrd1/REDs/

USEPA, Office of Pesticide Programs, R.E.D. Facts, Tebuthiuron, EPA-738-F-95-018, August 1995 http://www.epa.gov/oppsrrd1/REDs/

X. TOXICITY CATEGORY TABLES

TABLE I: HUMAN HAZARDS

Category	Signal Word	Route of Administration			Hazard	
		Acute Oral LD_{50} (mg/kg)	Acute Dermal LD_{50} (mg/kg)	Acute Inhalation LC_{50} (mg/l)	Eye irritation	Skin irritation
I (Highly Toxic)	**DANGER (poison)**	0–50	0-200	0-0.2	corrosive: corneal opacity not reversible within 7 days	corrosive
II (Moderately Toxic)	**WARNING**	>50–500	>200-2000	>0.2-2	corneal opacity reversible within 7 days; irritation persisting for 7 days	severe irritation at 72 hours
III (Slightly Toxic)	**CAUTION**	>500-5000	>2000-20.000	>2-20	no corneal opacity; irritation reversible within 7 days	moderate irritation at 72 hours
IV (Practically Non-toxic)	**NONE**	>5000	>20,000	>20	no irritation	moderate irritation at 72 hours

After *Pesticide User's Guide*, Ohio State University, Extension Bull. No. 745, 1998.

TABLE II: ECOTOXICOLOGICAL RISKS TO WILDLIFE (TERRESTRIAL AND AQUATIC)

Risk Category	Mammals	Avian	Avian	Fish or Aquatic Invertebrates
	Acute Oral LD_{50} mg/kg)	Acute Oral LD_{50} (mg/kg)	Acute Dietary LC_{50} (mg/kg)	Acute Concentration LC_{50} (mg/l)
Very Highly Toxic	<10	<10	<50	<0.1
Highly Toxic	10-50	10-50	50-500	0.1 – 1
Moderately Toxic	51-500	51-500	501-1,000	>1 – 10
Slightly Toxic	501-2,000	501-2,000	1,001-5,000	>10 – 100
Practically Non-toxic	>2,000	>2,000	>5,000	>100

Table II created from information contained in *Pesticides and Wildlife*, Whitford, Fred, et al., Purdue University Cooperative Extension Service PPP-30, 1998.

Disclaimers and Other Legal Information:

Mention of a trademark, vendor, technique, or proprietary product does not imply or constitute an endorsement of the product by the United States Department of Energy - Bonneville Power Administration (USDOE-BPA), its employees, and its contractors, and does not imply or endorse any product to the exclusion of others. In all cases, the user is required by law to follow all pesticide label instructions and restrictions.

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